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UCT study reveals how long-necked dinosaurs became giants

New research by scientists at the University of Cape Town (UCT) has discovered a new pattern of growth in dinosaurs. Some of the iconic Mesozoic long-necked dinosaurs (officially known as the derived sauropodomorphs or sauropods) reached about 36 metres in length and weighed about 63 503 kg.

The research was led by PhD candidate Emil Krupandan from UCT's Biological Sciences, under the supervision of Professor Anusuya Chinsamy-Turan and Dr Diego Pol (from the Museo Paleontológico Egidio Feruglio in Trelew, Argentina).

How these majestic creatures reached these sizes have perplexed scientists and the general public for decades. Analyses of the microstructure of fossil bones of these creatures have shown that they attained these massive sizes through constant sustained growth until the attainment of skeletal maturity. Thereafter, growth marks (like growth rings in a tree) develop in the outer regions of the bone.

Lead author, Krupandan, says: "What we're seeing in *Antetonitrus* is that these dinosaurs show a mosaic of rapid bone growth, with erratic placement of growth marks and textural shifts in the organisation of fibro-lamellar bone that are not quite as regular as their ancestors - essentially we're seeing an intermediate growth strategy with elements of both basal and derived sauropodomorph growth strategies present in these early sauropods."

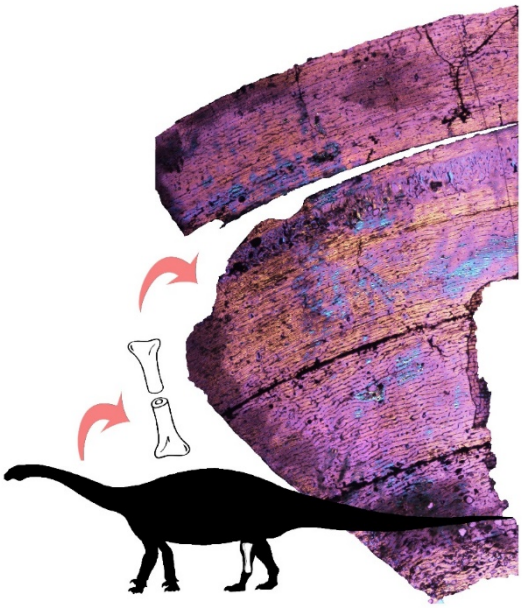
In contrast, the ancestors of these dinosaurs (basal sauropodomorphs), were smaller and more bipedal animals, and they exhibited cycles of fast and slow growth – similar to the way a cake would be interrupted by layers of icing. Up until recently, quadrupedal sauropods and bipedal basal sauropodomorphs growth dynamics were thought of as existing in a dichotomy between slower cyclical growth and rapid sustained growth strategies.

Research shows that the bone microstructure of the 235 million-year-old basal sauropod dinosaur *Antetonitrus ingenipes* from South Africa tells a different story. This work indicates that *en route* to the attainment of gigantism dinosaurs such as *Antetonitrus*, that lie in between the smaller basal sauropodomorph dinosaurs and giant sauropods, have a

unique pattern of growth that is actually intermediate between that of the ancestors (basal sauropodomorphs) and the descendants (the derived sauropodomorphs).

UCT palaeobiologist Professor Chinsamy-Turan comments: “These findings of an intermediate growth strategy for the South African *Antitonitrus* challenges previous ideas that the growth strategies of the small bipedal ancestral dinosaurs and that of the massive quadrupedal sauropods was dichotomous.”

Krupandan adds: “Recent, new work by other authors, on related members of this group of derived sauropod ancestors called Lessemsauridae, also finds similar growth patterns in these close relatives. We’re seeing that as early as the Late Triassic the steps towards gigantism were emerging, as evidenced by increases in bone growth rates of these creatures. It’s also important to note that this group shows a unique growth strategy.”



The Thin section of *Antetonitrus ingenipes* showing bone microstructure of long bone.

PIC**:** Germán Montoya Sanhueza

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